



Graphic Designer: Mathematics and Cereal Box Design

Performance Task

Introduction

The design of cereal boxes is strongly connected to mathematics in that volume, surface area, and shape must be taken into account to create a successful design. Cereal boxes are usually shaped like rectangular prisms and the volume of each box affects how many ounces of cereal are in the box. Anytime companies design new cereal boxes they must consider how the mathematics and people's perceptions affect the success of the product. In this task you will be investigating these factors as you create new cereal box designs for a company. Students may work with an existing cereal or create a new brand of their own.

Big Idea / Essential Questions

Big Idea

- Spatial reasoning and visualization are ways to orient thinking about the physical world.

Essential Questions

- How can we use 2 and 3 dimensional shapes and attributes to describe real world solids and solve problems?

G.R.A.S.P.

Goal

Your goal is to create a new design for a children's cereal box. The company is tasking you with creating two potential new box designs that have the same volume as the original design but that are slightly different. You will have to use your knowledge of mathematics, art and design. In addition, use what you know about why consumers are attracted to certain products more than others to help you.

Role

You are a graphic artist working for a cereal company. In this role it is important to use knowledge of geometry and design to create new cereal box designs for a children's cereal.

Audience

Your audience will be the company leaders as well as a few focus groups. First, you must tell company leaders about the re-designs you are proposing and the

mathematics behind each. After this, your design must gain the approval of focus groups – one of children between the ages of 5-10 and another of parents between the ages of 30-45. The company plans to ask the focus groups to give feedback about whether they like the new designs.

Situation

The design of cereal boxes is strongly connected to mathematics in that volume, surface area, and shape must be taken into account to create a successful design. Cereal boxes are usually shaped like rectangular prisms and the volume of each box affects how many ounces of cereal are in the box. Anytime companies design new cereal boxes they must consider how the mathematics and people’s perceptions affect the success of the product. In this task you will be investigating these factors as you create new cereal box designs for a company. Students may work with an existing cereal or create a new brand of their own.

Products

1. Proposal and Sketch

Find the volume and dimensions of a cereal box that you are familiar with or use information provided by your teacher to begin the design process. Determine two new box designs that are slightly different than the original box but have the same volume as the original box. Create a three dimensional sketch of each design and provide a written explanation of each. This written piece should share why you are proposing these designs based upon the math and any other factors. The sketches and explanations should be combined into a proposal that you will provide to the company.

- What math formulas and dimensions will you need to determine the volume of the cereal boxes?
- How can dimensions be adjusted while still keeping the same volume?

Graphic Designer: Mathematics and Cereal Box Design - Proposal & Sketch

Achievement Levels	1	2	3	4
Conventions (x1)	Minimal control of sentence formation. Many sentences are awkward and fragmented. Many errors may be present in grammar, usage, spelling, and punctuation, and many of those errors may interfere with meaning.	Limited and/or inconsistent control of sentence formation. Some sentences may be awkward or fragmented. Many errors may be present in grammar, usage, spelling, and punctuation, and some of those errors may interfere with meaning.	Adequate control of sentence formation. Some errors may be present in grammar, usage, spelling and punctuation, but few, if any, of the errors that are present may interfere with meaning.	Thorough control of sentence formation. Few errors, if any, are present in grammar, usage, spelling, and punctuation, but the errors that are present do not interfere with meaning.
Content (x1)	The proposal is a minimal explanation of the new box designs and includes little required information.	The proposal is a partial explanation of the new box designs and includes some required information.	The proposal is a sufficient explanation of the new box designs and includes most required information.	The proposal is a thorough explanation of the new box designs and includes all required information.
3-D Models (x1)	Product shows three-dimensional model(s) of the box(es) with few dimensions and units shown.	Product shows three-dimensional models of the 2 boxes with some dimensions and units shown.	Product shows three-dimensional models of the 2 boxes with most dimensions and units clearly shown.	Product shows three-dimensional models of the 2 boxes with all dimensions and units clearly shown.
Quality	An attempt is made to create a 3-D representation of the	Sketches are a minimally accurate 3-D representation of the	Sketches are a mostly accurate 3-D representation of the	Sketches are an accurate 3-D representation of the proposed box designs that

Achievement Levels	1 proposed box designs.	2 proposed box designs.	3 proposed box designs that include appropriately labeled dimensions.	4 include appropriately labeled dimensions.
Volume (x1)	Student demonstrates little understanding of the concept of volume and how it is applied in this context.	Student demonstrates some understanding of the concept of volume and how it is applied in this context.	Student demonstrates adequate understanding of the concept of volume and how it is applied in this context.	Student demonstrates strong understanding of the concept of volume and how it is applied in this context.

2. Prototype/Material Preparations

Using your two new box designs, determine how much cardboard would be necessary to construct each one. Company designers will use this information to help them determine production costs should your design be approved. Create a net of each box in the coordinate plane and be prepared to explain the mathematical calculations you use to determine the amount of cardboard needed to construct each of your designs. This can be done with the use of software, an online tool, or by hand. As an extension, you may want to construct each of your designs from materials available to you.

- How will the placement of the net impact your area calculations?
- What formulas do you need to determine the area of all sections of your cereal box net?

Graphic Designer: Mathematics and Cereal Box Design - Materials Preparation

Achievement Levels	1	2	3	4
Precision (x1)	Mathematical calculations and/or their interpretations are inaccurate.	Some mathematical calculations and their interpretations in the situation are accurate.	Most mathematical calculations and their interpretations in the situation are accurate.	All mathematical calculations and their interpretations in the situation are accurate.
Justifying and Communicating Conclusions (x1)	Student(s) minimally support their argument about the amount of cardboard needed using the drawings and mathematical calculations.	Student(s) somewhat support their argument about the amount of cardboard needed using the drawings and mathematical calculations.	Student(s) adequately support their argument about the amount of cardboard needed using the drawings and mathematical calculations.	Student(s) strongly support their argument about the amount of cardboard needed using the drawings and mathematical calculations.
Nets and the Coordinate Plane (x1)	Student draws inaccurate nets of their box designs which lack labeled vertices.	Student draws partially accurate nets of their box designs on the coordinate plane with some labeled vertices.	Student draws mostly accurate nets of their box designs on the coordinate plane with labeled vertices.	Student draws accurate nets of their box designs on the coordinate plane with labeled vertices.
Independent Problem Solving (x1)	No attempt is made to select and utilize appropriate tools/formulas to find the area of the nets drawn after significant prompting.	Appropriate tools/formulas are selected and utilized to find the area of the nets drawn after significant prompting.	Appropriate tools/formulas are mostly independently selected and utilized to find area of the nets drawn.	Appropriate tools/formulas are independently selected and utilized to find the area of the nets drawn.
Surface Area and the Coordinate Plane (x1)	Student(s) utilize information from the net on the coordinate plane to calculate the surface area of the box design with many errors.	Student(s) utilize information from the net on the coordinate plane to calculate the surface area of the box design with some errors.	Student(s) utilize information from the net on the coordinate plane to calculate the surface area of the box design with few errors.	Student(s) utilize information from the net on the coordinate plane to calculate the surface area of the box design with no errors.

3. Graphic Design

The cereal company has designated information that they want to put on both side panels of a new cereal box but it is up to you to create engaging, creative designs for the front and back of the box. Knowing that this cereal is categorized as a children's cereal by the company, come up with an artistic design that you believe will be attractive to potential customers and be prepared to present it to company leaders.

- What is the area on the front and back sides of your cereal box?
- What designs may appeal to children of these ages?
- What color scheme will you use?

Graphic Designer: Mathematics and Cereal Box Design - Graphic Design

Achievement Levels	1	2	3	4
Research (x1)	Product demonstrates a lack of research conducted around the topic.	Product demonstrates that minimal research was conducted around the topic using few credible or appropriate sources.	Product demonstrates that adequate research was conducted around the topic using several sources that are credible and appropriate.	Product demonstrates that thorough research was conducted around the topic, using several sources that are credible and appropriate.
Presentation of Design (x1)	Presentation is given without adequate volume or eye contact and a minimally logical sequence of ideas.	Presentation is given with adequate volume, eye contact, and a somewhat logical sequence of ideas.	Presentation is given with adequate volume, eye contact, and mostly logical sequencing of ideas.	Presentation is given with appropriate volume, eye contact and logically sequenced ideas.
Layout (x1)	Lack of balance in color and space. Information and graphics are not organized. Information is not conveyed to audience.	Attempt at balanced use of color and space. Information and graphics are not very well organized. Information is conveyed to audience.	Balanced use of color and space. Information and graphics are organized. Information is conveyed to audience.	Balanced use of color and space. Information and graphics are very well-organized and convey intended message to audience.
Originality (x1)	Design reflects a copy of existing advertisement. Lacking required elements.	Unoriginal design that reflects or mimics a familiar advertisement. Elements included lack creativity.	Original design but reflects or mimics a familiar advertisement. Elements included are creative.	Original design that does not reflect or mimic a familiar advertisement. Elements included are creative and reflect original designs.

4. Store Display (Advertisement)

Develop a display that would stand in the aisle of a grocery store. This display will need to grab the attention of your intended customers through your design. This display should advertise the cereal box's makeover and how it is good for the customer. Use your creativity and the mathematics behind the redesign to come up with an eye-catching way to re-introduce the cereal to the consumer and encourage them to purchase it!

- What makes a store display noticeable?
- How is your redesign different from most other cereals seen in stores?

Graphic Designer: Mathematics and Cereal Box Design - Store Display

Achievement Levels	1	2	3	4
Graphics (x1)	Graphics selected do not enhance product. Connections to intended purpose are not apparent.	Graphics selected attempt to enhance product, but are not clearly connected to purpose. Some elements of graphics included support intended message to audience. Graphics enhance	Graphics selected to convey intended message to audience. Graphics enhance product.	Original graphics created or selected to convey intended message to audience. Graphics enhance product.

Achievement Levels	1	2	3	4
Originality (x1)	Design reflects a copy of existing advertisement. Lacking required elements.	Unoriginal design that reflects or mimics a familiar advertisement. Elements included lack creativity.	Original design but reflects or mimics a familiar advertisement. Elements included are creative.	Original design that does not reflect or mimic a familiar advertisement. Elements included are creative and reflect original designs.
Production and Consumption (x1)	The display design minimally engages the consumer or highlights the value of the cereal for the consumer as it compares to other available products.	The display design somewhat engages the consumer and highlights the value of the cereal for the consumer as it compares to other available products.	The display design sufficiently engages the consumer and highlights the value of the cereal for the consumer as it compares to other available products.	The display design strongly engages the consumer and highlights the value of the cereal for the consumer as it compares to other available products.
Using Mathematics to Persuade (x1)	Product minimally uses the mathematics of the design to persuade the audience of the benefits of the new cereal box.	Product partially uses the mathematics of the design to persuade the audience of the benefits of the new cereal box.	Product sufficiently uses the mathematics of the design to persuade the audience of the benefits of the new cereal box.	Product expertly uses the mathematics of the design to persuade the audience of the benefits of the new cereal box.

5. Product Placement Report

The company is concerned about making sure their cereal boxes catch shoppers'™ attention in the stores. Where the cereal boxes are placed in an aisle, and how many boxes the customer sees, can affect whether or not the shopper buys your company's™ cereal. For example, cereal boxes that are tall might have to be placed on the top shelf because they do not fit on the shelves at eye level. Cereal boxes that are wider than others may not be able to fit many boxes in a row, which may affect whether it catches a shopper's™ attention.

Your task is to investigate where on a grocery store shelf your two new designs could fit and how many would be in a row based upon their width. You may investigate the shelf length and height at your local grocery store or you may work off the dimensions provided below. You will then present your findings in a short report to the company leaders.

Shelf Height: 35 cm

Shelf Length: 116 cm

- What math concepts will help you determine if your cereal box re-designs fits on the shelves in local grocery stores?
- Which shelves are the most eye-catching and which are the least?

Graphic Designer: Mathematics and Cereal Box Design - Product Placement Report

Achievement Levels	1	2	3	4
Conventions (x1)	Minimal control of sentence formation. Many sentences are awkward and fragmented. Many errors may be present in grammar, usage, spelling, and punctuation, and many of those errors may interfere with meaning.	Limited and/or inconsistent control of sentence formation. Some sentences may be awkward or fragmented. Many errors may be present in grammar, usage, spelling, and punctuation, and some of those errors may interfere with meaning.	Adequate control of sentence formation. Some errors may be present in grammar, usage, spelling and punctuation, but few, if any, of the errors that are present may interfere with meaning.	Thorough control of sentence formation. Few errors, if any, are present in grammar, usage, spelling, and punctuation, but the errors that are present do not interfere with meaning.

Achievement Levels (x1)	1	2	3	4
	No apparent arrangement of content with some effective transitions.	Unclear arrangement of content with some effective transitions.	Logical arrangement of content with some effective transitions.	Appropriate and clear arrangement of content with evident and/or effective transitions.
Mathematical Calculations (x1)	Mathematical calculations and/or their interpretations are inaccurate.	Some mathematical calculations and their interpretations in the situation are accurate.	Most mathematical calculations and their interpretations in the situation are accurate.	All mathematical calculations and their interpretations in the situation are accurate.
Content (x1)	The product provides little explanation of the number of boxes of each design that could fit on a specific store shelf based upon its dimensions.	The product provides some explanation of the number of boxes of each design that could fit on a specific store shelf based upon its dimensions.	The product provides a sufficient explanation of the number of boxes of each design that could fit on a specific store shelf based upon its dimensions.	The product provides a clear, thorough explanation of the number of boxes of each design that could fit on a specific store shelf based upon its dimensions.